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(54) Processable plastics containers

(57) A processable (*i.e.* sterilisable or pasteurisable) container of synthetic plastics material, such as polypropylene, is provided with improved antistatic properties by incorporating a fatty acid ester of glycerol containing at least 80% of the monoester in the plastics material. The preferred ester is glycerol monostearate, which may be incorporated in an amount of 1% to 1.5% by weight of the plastics material.

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SPECIFICATION

Processable plastics containers

This invention relates to processable plastics containers, that is containers made of synthetic plastics material and capable of withstanding temperatures of at least 100°C, such as are used in the processing of foodstuffs by sterilisation or pasteurisation. Processable plastics containers are thus designed to be sterilised or pasteurised together with their contents after filing, closing and sealing the containers.

In order to reduce or eliminate the deposition of dust on plastics containers it is common practice either to incorporate an antistatic agent in the synthetic plastics material (internal antistatic agent) or to apply the agent externally by spraying or coating from an aqueous solution (external antistatic agent). The internal antistatic agents are considered permanent as any antistatic agent removed by handling or washing is replenished by further material migrating to the surface.

A commonly used internal antistatic agent is glycerol monostearage which is supplied commercially for this purpose with a monoester content ranging from 40%—65%. There are two main methods for the manufacture of fatty acid monoesters of glycerol:—

1) direct reaction of the fatty acid with excess glycerol under esterification conditions, and
2) reaction of the fatty triglyceride with an excess of glyerol.

The reactions in both cases produce mixtures of mono, di- and tri-glycerides, the relative yields of each depending on the reaction conditions. The commercial grades with monoester contents of 40%—65% have been found effective in non-processable containers, but we have found that these and other antistatic agents have little antistatic activity at recommended levels (maximum 1.5%) in containers which have been processed, *e.g.* by sterilisation or pasteurisation. Glycerol monostearate with a monoester content of 65% is only really effective as an antistatic agent in processed containers at a concentration of 2%, at which level undesirable side effects may be encountered during extrusion and thermoforming, such as screw slip, surging and web instability. Also, poor ink adhesion on printed containers may result if excess antistatic agent is present on the surface. It would appear that at concentrations which are low enough to avoid such undesirable side effects the conventional antistatic agents in synthetic plastics materials are prevented from migrating by changes in the polymer structure and/or are leached from the plastics material by the processing operation.

It is an object of the present invention to provide a processable plastics container with improved antistatic properties.

According to the present invention, in a container made of a synthetic plastics material and capable of withstanding temperatures of at least 100°C, a fatty acid ester of glycerol containing at least 80% of the monoester is incorporated in the plastics material as an antistatic agent. It has surprisingly been found that the use of a fatty acid ester of glycerol having the specified higher content of monoester than has conventionally been used gives the containers substantially improved antistatic properties after processing. While the mechanism causing the improvement is not fully understood, we believe that it is probably due to reduced water dispersability of the ester under the conditions prevailing during processing, *i.e.* sterilisation or pasteurisation, as a result of the higher melting point of the material with the higher monoester content.

The preferred fatty acid ester is glycerol monostearate, preferably containing substantially 90% of the monoester.

The synthetic plastics material used for the container is preferably polypropylene, though it is also possible to use a high density polyethylene or other polymers which are capable of withstanding temperatures of at least 100°C.

The fatty acid monoester may be incorporated in the synthetic plastics material in a conventional manner, *e.g.* by incorporation in a master batch or by dry mixing with the bulk polymer.

While the monostearate of glycerol is the preferred monoester, it is also possible to use other members of the homologous series of fatty acid esters, *e.g.* the monolaurate or monomyristate of glycerol, provided that the material consists of at least 80%, and preferably 90%, of the monoester. The monoester will normally be incorporated in the synthetic plastics material in an amount in the range from 1% to 1.5% by weight.

The containers according to the invention may be in the form of bottles, tubs, pots, collapsible tubes etc. and may be moulded by any of the usual methods, such as injection moulding, thermoforming, blow-moulding and extrusion.

EXAMPLE

The invention may be applied for example, to a processable container, *e.g.* for containing paté or similar foodstuffs, in the form of a pot of synthetic plastics material having a metal top panel seamed to the rim of the pot. A tear tab is provided to enable the purchaser to pull out substantially the whole of the top panel to obtain access to the foodstuff in the pot. Such a container is described and claimed in our co-pending British Patent Application No. 7944037.

In a particular example of the invention, the antistatic agent in the form of glycerol monostearate with a minimum monostearate content of 90%, sold by Albright and Wilson Ltd. under the Trade Mark

EMPILAN GMS NSE 90, is first incorporated with a pigment in a masterbatch of the synthetic plastics material *e.g.* polypropylene. A typical masterbatch would contain 10% glycerol monostearate, 50% titanium dioxide pigment and 40% polypropylene. The masterbatch is then mixed with the bulk polymer (polypropylene) to provide the desired proportion of antistatic agent in the container (say 1.25%) and the polymer is extruded to form a laminate from which the pot is thermoformed. The pot is filled with the foodstuff, *e.g.* paté, and the metal top panel is tightly seamed to the rim of the pot. The filled container is then processed by being sterilised in a water-filled retort at 115°C for one hour.

The effectivenesss of the antistatic agent can be measured by determining the charge decay rate after applying an electric charge to the surface of the processed container and from this calculating the half-life of such a charge. Tests were made in this manner on processed containers in accordance with the invention containing concentrations of 1.0%, 1.5% and 2.0% of glycerol monostearate (GMS) with a monostearate content of 90% (EMPILAN GMS NSE 90) and, for comparison, on a similar processed containers with the same concentrations of glycerol monostearate with a monostearate content of 65%. The following results were obtained:—

Antistatic agent: Concentration %	Container with GMS of 90% monoester content Charge half-life	Container with GMS of 65% monoester content Charge half-life
1.0	2.58 minutes	9.24 minutes
1.5	69.30 seconds	4.47 minutes
2.0	51.75 seconds	1.72 minutes

In practice, we find that a half-life greater than 3 minutes indicates an unacceptable antistatic performance. It can thus be seen that the containers according to the invention are acceptable even with a concentration of antistatic agent as low as 1%, whereas to achieve an acceptable antistatic performance with the GMS of 65% monoester content required a concentration of nearly 2% at which the undesirable side effects mentioned above are likely to be experienced.

CLAIMS

1. A container made of a synthetic plastics material and capable of withstanding temperatures of at least 100°C, wherein a fatty acids ester of glycerol containing at least 80% of the monoester is incorporated in the plastics material as an antistatic agent.

2. A container according to Claim 1 wherein the fatty acid ester is glycerol monostearate.

3. A container according to Claim 2 wherein the glycerol monostearate contains substantially 90% of the monoester.

4. A container according to any one of the preceding Claims wherein the synthetic plastics material is polypropylene.

5. A container according to any one of Claims 1 to 3, wherein the synthetic plastics material is a high density polyethylene.

6. A container according to any one of the preceding Claims wherein the monoester is incorporated in the synthetic plastics material in an amount of 1% to 1.5% by weight.

7. A container according to Claim 1 substantially as hereinbefore described in the foregoing Example.

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